Docket No.: 2328-050A **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	
Jian J. CHEN *et al.*	Confirmation No. 3505
U.S. Patent Application No. 10/647,347	Group Art Unit: 1763
Filed: August 26, 2003	Examiner: Luz L Alejandro

For: INDUCTIVE PLASMA PROCESSOR METHOD

REPLY BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellants submit this Reply Brief to discuss some electrical engineering terminology employed in the application because the Board members of the panel presumably have chemical backgrounds as a result of this appeal being from Chemical Group Art Unit 1792. In any event, it is evident from certain portions of the Examiner's Answer that the examiner does not have an appreciation of this terminology. This Reply Brief is also submitted because of inaccurate statements in the Answer.

Appellants' specification, at page 2, lines 15-18, in describing the prior art, indicates coils used in plasma processing produce oscillating RF fields having magnetic and electric field components to excite electrons and ions in the plasma. The description of the prior art, at page 6, lines 1-11, indicates a plasma processor coil can

include one or more windings, each having one or more turns. If a plasma processor coil includes only one winding, the terminology "coil" and "winding" are synonymous; see, for example, page 15, line 20, of Ni et al., WO 00/58993 (of record). Some in the prior art also refer to what appellants refer to as a "coil" an "antenna"; see, for example, antennas 300a and 300b, described in column 3, lines 33-37 of Lee et al., US Patent 6,288,493 (of record).

In the description of the preferred embodiment of Figure 2 of appellants' application, coil 24 includes windings 40 and 42. Winding 40 includes turns 54, 56 and 58, while winding 42 includes turns 64 and 66 (page 16, lines 5-20). Similarly, Figure 2 of Ni et al. (of record) is an illustration including coil 216 having a single winding having four electrically conducting turns 221-224, having the adjacent ends thereof connected to each other by straps 231-233 (page 15, line 11 - page 16, line 3). Appellants' use of the terms "coil", "winding", and "turn" is consistent with the use of these terms in the electrical engineering arts, as indicated, for example, by the enclosed copy of an article from Wikipedia, the free online encyclopedia, which the Board can consider by taking judicial notice. The article indicates a coil is formed when a conductor, usually a solid copper wire, is wound around a core or form to create a conductor or electromagnet. A turn is defined as one loop of wire in a coil having one or more turns. A winding is defined as a completed coil assembly with taps, etc. so that primary and secondary windings are included in a transformer.

The examiner's lack of understanding of these terms is manifested in the Examiner's Answer, for example, by (1) the last sentences in both of the only two full paragraphs on page 17 of the Answer, (2) the first full paragraph on page 19 of the Answer, (3) the last sentence of the paragraph in the center of page 19 of the Answer, and (4) the third sentence in the paragraph at the bottom of page 20 of the Answer.

The last sentence in the second full paragraph on page 17 of the Answer states: "Yoshida et al. and Ni et al. are being relied upon to show the movement of the windings

relative to each other." The identical words also appear in the last sentence of the first full paragraph on page 17.

It is clear from a consideration of the drawings of Yoshida et al. and Ni et al., as well as the words of Ni et al., that there is (1) only one winding in the portion of Yoshida et al. relied on by the examiner (the spiral coil 2 of Figures 1B and 6B) and (2) only one winding in Ni et al..

Figure 1B and column 4, lines 1-4 of Yoshida et al. indicate the interior end of spiral coil 2 is connected by a capacitor to one end of RF power source 3, while the exterior end of spiral coil 2 is connected to the other end of the RF power source and ground. An inspection of Figure 1B indicates spiral coil 2 has only a single winding, but many turns between the interior and exterior and is thereof. (The showing of spiral coil 2 in Figure 6B does not include the connections to RF power source 3 illustrated in Figure 1B, apparently because the showing in Figure 6 concentrates on the radial movement of coil 2 indicated by double headed arrow 25.) As a result, the relied upon portion of Yoshida et al. does not disclose a coil having plural windings, no less a coil having plural windings that are moved relative to each other.

Appellants are aware that Figures 8a end 8b of Yoshida et al. are illustrations of coils having two spiral windings, which Yoshida et al. refers to as coils; column 3, lines 28-37 and column 4, lines 24-29. However, there is no disclosure of the spiral coils (that is, windings) of Figures 8a and/or 8b being moved, and the inference is that they are not moved because the symmetrical shapes of the structures of Figures 8a and 8b do not suffer from the same problem as the asymmetrical spiral coil 2 of Figures 1b and 6b; column 5, lines 33-35. Certainly, Yoshida et al. has no disclosure of moving one of the spiral windings that form the coils of Figures 8a and 8b relative to each other.

Apparently, the examiner relies on the Ni et al. disclosure in connection with spiral like coil (that is, winding) 216, Figure 2, to support her contention that Ni et al.

discloses movement of windings relative to reach other. However, page 15, line 24 - page 16, line 3, of Ni et al. indicates coil 216 includes four constant diameter electrically conducting turns 221-224 having adjacent ends that are connected together by metal straps 231, 232 and 233. Of course, turns 221-224 are not windings. An inspection of Figure 2 and the foregoing cited discussion of Ni et al. indicate turns 221-224 are electrically connected in series with each other to form a single winding or coil. The structural similarity of turns 221-224 of Ni et al. to appellants' turns 54-58, 64 and 66 clearly indicates the turns recited in appellants' claims cannot be considered to be windings. As a result, Ni et al. does not disclose a coil having plural windings, no less a coil having plural windings that are moved or turned relative to each other.

The first full paragraph on page 19 of the Answer states:

> Appellant argues that Yoshida et al. fails to disclose moving interior and exterior windings of a coil relative to each other. The examiner respectfully disagrees and contends that Yoshida et al. does disclose that the interior and exterior windings move relative to each other since motor 23 moves the windings. It should be noted that the inside winding of the coil of Yoshida et al. will move more and/or faster than the outside winding. Furthermore, the claims do not require two coils instead they only require two windings...

This portion of the Examiner's Answer refers to the radial movement (indicated by double headed arrow 25) by motor 23 of coil 2 in the processor of Figure 6A. Figure 1B and column 4, lines 1-4 of Yoshida et al. indicate the interior end of spiral coil 2 of Figure 6B is connected by a capacitor to one end of RF power source 3, while the exterior end of spiral coil 2 is connected to the other end of the RF power source and ground. An inspection of Figure 1B indicates spiral coil 2 has only a single winding, but many turns between the interior and exterior and is thereof. Hence, Figure 6B of Yoshida et al. does not have a coil having interior and exterior windings.

Further, the allegation that different portions of the Yoshida et al. spiral coil 2 are moved by motor 23 so that an inside portion of the coil is moved more and/or faster than an outside portion of the coil has no foundation from the reference. If the examiner is relying on inherency for this concept, she has failed to provide any rationale or evidence to show that the inside portion of spiral coil 2 moves more and/or faster than the outside portion of the coil, as required, for example, by In re Rijckaert, 9 F.3d 1531, 1534, USPQ2d 1955, 1957 (Federal Circuit 1993); In re Oelrich, 666 F.2d 578, 581-582, 212 USPQ 323, 326 (CCPA 1981); In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Federal Circuit 1999); Ex parte Levy, 17 USPQ2d 1461, 1464 (Board of Patent Appeals and Interferences 1990). The allegation that different portions of spiral coil 2 are moved so that an inside portion thereof is moved more and/or faster than an outside portion thereof is also contrary to the implication of the Yoshida disclosure at column 5, lines 15 and 16 which indicates coil 2 (not a portion thereof) was moved plus or minus 1 cm in radial direction 25. Also, there is no showing of any structure in any part of motor 23 that causes any portion of coil 2 to move differently from any other portion of the coil.

As a result of the foregoing, as well as the arguments advanced in appellants' original Brief, the entire basis for any rejection based on Yoshida et al. is without merit.

The last sentence of the paragraph in the middle of page 19 of the Answer states: "Ni et al. discloses moving interior and exterior windings relative to each other." As discussed supra, coil 216 of Ni et al. has only a single winding. Consequently, Ni et al. can not disclose moving or turning interior and exterior windings relative to reach other.

The last full sentence on page 20 of the Answer states:

> "It is clear from fig. 2 of the Ni et al. reference that motors 201, 202, and 203 are connected to different windings of the

> plasma excitation coil of Ni et al. and that each motor can be moved independently from the other two and therefore, a position of an interior winding can be moved relative to a position of an exterior winding."

As discussed supra, motors 201, 202 and 203 are connected to different turns of the coil. The claims require windings, not turns, of the coil to be moved or turned relative to each other. Further, motors 201, 202 and 203 do not turn the turns of the reference relative to each other, but translate the turns relative to the processor window, so the turns are moved up and down. In this regard, claims 33, 34, and 36-38 require the windings to be turned relative to each other. Thus, the examiner ignores the language of Ni et al. which states motors 201, 202 and 203 drive lead screws 211-213 that in turn drive blocks 241-243 which are fixedly connected to turns 221-224 (not windings); page 16, lines 4-32. A turn is not a winding; the examiner has provided no support for her apparent position that a turn is a winding. Her implication that they are the same shows a lack of knowledge about basic aspects of electricity, electrical engineering and perhaps the English language; "turn" is a common English word, the understanding of which does not require knowledge of electricity.

Based on the foregoing, neither Yoshida et al. nor Ni et al., relied on by the examiner to disclose the requirement of claims 32 and 39 to move the position of exterior and interior windings relative to each other, discloses that step. Further, neither reference discloses the requirement of claims 32, 33 and 36 to turn the exterior and interior windings relative to each other about an axis.

The penultimate sentence of the only full paragraph on page 5 of the Answer states Yoshida et al. discloses moving a coil. This statement is irrelevant to the requirements of the independent claims which require relative movement of interior and exterior windings of a coil.

The penultimate sentence of the only full paragraph on page 7 of the Answer states Ni et al. discloses moving different positions or changing the relative angular position of a coil. This statement is also irrelevant because it does not consider the requirement of the claims for relative movement of the interior and exterior windings of a coil. In addition, motors 201-203 of Ni et al. do not change the relative position of a coil. Instead, motors 201-203 move turns 223 and 224 vertically relative to window 46 so all portions of these turns are spaced above window 48 by the same distance or different parts of these turns are spaced above the window by differing amounts; page 15, lines 15-20; page 16, lines 15-23.

There is repeated mention in the Answer about performing the method on a plurality of different processors. The examiner apparently uses the word "plurality" because that word is inclusive of two different processors, as disclosed by Savas. However, however, claim 32 requires the manufacturing method to be performed on many different processors, while claims 36 and 39 require the method to be performed on several processors. Of course, the words "many" and "several" preclude the number two; the dictionary definition of "many" is "a large but indefinite number" and the definition of "several" is more than two or three; see the attached print-outs from The American Heritage Dictionary of the English Language, fourth edition, online. Consequently, the Savas structure including two different processors does not meet the requirements of claims 32, 36 or 39. Further, there is no indication the Savas structure deals with appellants' problem dealing with anomalies in many or several processors, as set forth on pages 12 and 13 of the original Brief. The claims indicate this problem is resolved because: (1) claim 32 indicates tests are conducted on each processor to obtain optimum uniform plasma distribution in each processor; (2) claims 33 and 36 state the exterior and interior windings of each particular processor are turned relative to each other until tests indicate optimum uniform plasma distribution is achieved in each processor; and (3) claim 39 requires the exterior and interior windings of each particular processor to be moved relative to each other until tests indicate optimum uniform plasma distribution is achieved in each processor.

The Answer repeatedly states it would have been obvious to one of ordinary skill in the art to produce more than one product to achieve financial gain since more than one product can be made and/or be sold. However, the references the examiner relies on are not concerned with manufacturing. Consequently, one of ordinary skill in art would not have looked to these references for a teaching concerned with manufacturing to overcome anomalies in different manufactured processors to obtain uniform plasma distribution in each processor.

The second sentence of the paragraph beginning on page 18 of the Answer erroneously states the rejected claims do not recite a method that is performed on three or more processors. As discussed supra, the words "many" and "several" require the method to be performed on three or more processors.

The Wikipedia and dictionary definitions are submitted at this time because of new arguments set forth in the Answer. It was not previously realized by appellants that the examiner did not understand the meaning of "turns" and "windings."

Based on the foregoing and the arguments set forth in the original Brief, reversal of the far rejection is in order.

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To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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The American Heritage® Dictionary of the English Language: Fourth Edition. 2000.

many

SYLLABICATION: man·y

PRONUNCIATION: ◅ mĕn'ē

ADJECTIVE: Inflected forms: **more** (◅ môr, mōr), **most** (◅ mōst)
1. Being one of a large indefinite number; numerous: *many a child; many another day.* **2.** Amounting to or consisting of a large indefinite number: *many friends.*

NOUN: *(used with a pl. verb)* **1.** A large indefinite number: *A good many of the workers had the flu.* **2.** The majority of the people; the masses: *"The many fail, the one succeeds"* (Tennyson).

PRONOUN: *(used with a pl. verb)* A large number of persons or things: *"For many are called, but few are chosen"* (Matthew 22:14).

IDIOM: **as many** The same number of: *moved three times in as many years.*

ETYMOLOGY: Middle English, from Old English *manig.* See **menegh-** in Appendix I.

The American Heritage® Dictionary of the English Language: Fourth Edition. 2000.

several

SYLLABICATION: sev·er·al

PRONUNCIATION: sĕv'ər-əl, sĕv'rəl

ADJECTIVE: **1.** Being of a number more than two or three but not many: *several miles away.* **2.** Single; distinct: *"Pshaw! said I, with an air of carelessness, three several times"* (Laurence Sterne). **3.** Respectively different; various: *They parted and went their several ways.* See synonyms at **distinct**. **4.** *Law* Relating separately to each party of a bond or note.

PRONOUN: *(used with a pl. verb)* An indefinite but small number; some or a few: *Several of the workers went home sick.*

ETYMOLOGY: Middle English, separate, from Anglo-Norman, from Medieval Latin *s ēparālis, sēperālis*, from Latin *sēpar*, from *sēparāre*, to separate. See separate.

OTHER FORMS: **sev'er·al·ly** —ADVERB

Electromagnetic coil

From Wikipedia, the free encyclopedia
(Redirected from Electromagnetic Coil)

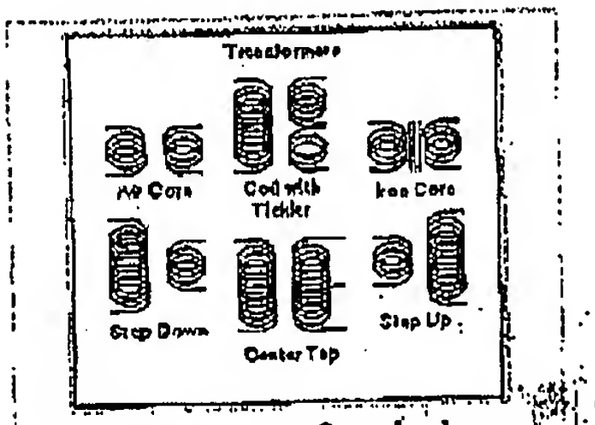

Diagram of typical transformer configurations

An **electromagnetic coil** (or simply a "coil") is formed when a conductor (usually a solid copper wire) is wound around a core or form to create an inductor or electromagnet. One loop of wire is usually referred to as a *turn*, and a coil consists of one or more turns. For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are often coated with varnish and/or wrapped with insulating tape to provide additional insulation and secure them in place. A completed coil assembly with taps etc. is often called a *winding*. A transformer is an electromagnetic device that has a *primary winding* and a *secondary winding* that transfers energy from one electrical circuit to another by magnetic coupling without moving parts.
The term *tickler coil* usually refers to a third coil placed in relation to a primary coil and secondary coil.
A coil tap is a wiring feature found on some electrical transformers, inductors and coil pickups, all of which are sets of wire coils. The coil tap(s) are points in a wire coil where a conductive patch has been exposed (usually on a loop of wire that extends out of the main coil body). As self induction is larger for larger coil diameter the current in a thick wire tries to flow on the inside. The ideal use of copper is achieved by foils. Sometimes this means that a spiral is a better alternative. Multilayer coils have the problem of interlayer capacitance, so when multiple layers are needed the shape needs to be radically changed to a short coil with many layers so that the voltage between consecutive layers is smaller (making them more spiral like).

Analysis

The inductance of single-layer coils can be calculated to a reasonable degree of accuracy with the simplified formula

$$\mu\mathrm{H} = \frac{R^2 N^2}{9R + 10L}$$

where μH (microhenries) are units of inductance, R is the coil radius (measured in inches to the center of the conductor), N is the number of turns, and L is the length of the coil in inches. The online Coil Inductance Calculator (http://www.66pacific.com/calculators/coil_calc.aspx) calculates the inductance of any coil using this formula. Higher accuracy estimates of coil inductance require calculations of considerably greater complexity. A layperson's translation is:

$$Inductance^{microhenries} = (radius^2 * numberofturns^2)/(9*radius+10*length)$$

In calculating the distances, one centimeter is equal to 0.393700787 inches and one inch is equal to 2.54 centimeters. The inductance formula uses inches. The relationship between the radius and the circumference of a coil is $r = c/2\pi$, with r as the radius, c as the circumference, and π (the Greek letter pi) as the constant 3.141. The circumference of a coil can be calculated by $c = \pi \cdot d$, with d as the diameter of the coil and π as 3.141.

Coil examples

Some common electromagnetic coils include:

Nikola Tesla's flat spiral coil.

- A *bifilar coil* is a coil that employs two parallel windings.
- A *Barker coil* is used in low field NMR imaging.
- A *Balun* is set of transformer coils for transmission lines.
- A *Braunbeck coil* is used in geomagnetic research.
- A *degaussing coil* is used in the process of removing permanent magnetism (magnetic hysteresis) from an object.
- A *choke coil* (or *choking coil*) is low-resistance inductor used to block alternating current while passing direct current.
- A **Flat coil** is used in thin electric motor.
- A *Garrett coil* is used in metal detectors.
- A *Helmholtz coil* is a device for producing a region of nearly uniform magnetic field.
- A *hybrid coil* (or *bridge transformer*) is a single transformer that effectively has three windings.
- An *induction coil* (or *ignition coil*) is an electrical device in common use as the ignition system (*ignition coil or spark coil*) of internal-combustion engines.
- A *loading coil* is, in electronics, a coil (inductor) inserted in a circuit to increase its inductance. Archaically called *Pupin coils*.
- A *multiple coil magnet* is an electromagnet that has several coils of wire connected in parallel.
- A *Maxwell coil* is a device for producing almost a constant magnetic field.
- A **Micro coil** use in security devices.
- A *Oudin coil* is a disruptive discharge coil.
- The *polyphase coils* are connected together in a polyphase system such as a generator or motor.
- A *relay coil* is the copper winding part of a relay that produces a magnetic field that actuates the mechanism.
- A *Repeating coil* is a voice-frequency transformer.
- A *Rogowski coil* is an electrical device for measuring alternating current.
- A *single coil* is a type of pickup for the electric guitar.
- A *solenoid* is a mechanical device, based around a *coil of wire*, that usually converts energy into linear motion, however solenoids also come in a rotary motion (normally up to a turn of 90 degrees).
- A *telephone cord* is usually manufactured in a coiled fashion, as to allow maximum length while taking up minimum space when not in use.
- A *Tesla coil* is category of disruptive discharge coils, usually denoting a resonant transformer that generates very high voltages at radio frequencies.
- A *voice coil* which is mounted to the moving cone of a loudspeaker.

Other applications of coils exist in the field of electromagnetic devices. A coilgun is a type of cannon that uses a series of electromagnetic coils to accelerate a magnetic shell to very high velocities. The filament of an incandescent light bulb has usually the shape of a coiled coil, in order to fit the long filament in a small space.

Further reading

- Querfurth, William, "*Coil winding; a description of coil winding procedures, winding machines and associated equipment for the electronic industry*" (2d ed.). Chicago, G. Stevens Mfg. Co., 1958.

- Weymouth, F. Marten, "*Drum armatures and commutators (theory and practice) : a complete treatise on the theory and construction of drum winding, and of commutators for closed-coil armatures, together with a full résumé of some of the principal points involved in their design; and an exposition of armature reactions and sparking*". London, "The Electrician" Printing and Publishing Co., 1893.
- "*Coil winding proceedings*". International Coil Winding Association.
- Chandler, R. H., "*Coil coating review, 1970-76*". Braintree, R. H. Chandler Ltd, 1977.

External articles

- R. Clarke, "*Producing wound components (http://www.ee.surrey.ac.uk/Workshop/advice/coils/)*". Surrey.ac.uk, 2005 October 9.

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